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Final Report

Sources of Cloud Nuclei and Development of Remote Sensing Techniques for Cloud Parameters

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June 1992

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Contract Title:	Sources of Cloud Nuclei and Development of Remote Sensing Techniques for Cloud Parameters
Number:	N00014-90-J1288
Principal Investigator:	S. Twomey, Institute of Atmospheric Physics, The University of Arizona
ONR Program Manager:	Dr. W. A. Hoppel

The research focused on the problem of remotely determining the effective drop radius and optical thickness of marine stratus, and interpreting the results in terms of cloud susceptibility. Cloud susceptibility is here defined as the increase in albedo resulting from the addition of one cloud drop per cubic centimeter holding the cloud liquid water constant. The remote sensing technique employed made use of the AVHRR spectral channels on board the NOAA polar orbiting satellites. The method required an assumption of the cloud liquid water content which, for the marine stratus studied, was assumed to be 0.3 g/m^3.

As by-products of cloud susceptibility, cloud optical thickness and effective droplet radius was also determined. The values of these two parameters were compared to in situ measurements. Some discrepancies were noted, particularly in cloud optical thickness.

The retrieved range of cloud susceptibilities varied by about 2 orders of magnitude, from as low as 0.23×10^{-3} in stratus off the west coast of southern Africa to about 20×10^{-3} off the west coast of North America. California valley fog had values as low as 0.05×10^{-3}, extending the measured range for all clouds studied to almost three orders of magnitude. Studies indicated that ship tracks are less susceptible than non-track regions, due to the contamination of the tracks by CCN from the ships effluent. The susceptibility in and out of track may only differ by a factor of 2 to 4, or as high as 30 for their stratus.